Peter Ifju

1. Air Force – Aerodynamic control of micro air weapons, $100,000

This project is an ITAR controlled project and therefore no details of vehicles can be provided. The essence of the project is to implement novel actuator technologies on micro air vehicles that can lead to a more robust design.

2. Air Force – Expanding the design space of flexible flapping wings by advancing fabrication and optimization methodologies, $559,011

This sponsored project involves the understanding of how to improve thrust generation and efficiency of flapping wing micro air vehicles by incorporating flexibility into the structure of the wing. Wings manufactured using a carbon fiber skeleton and thin plastic membranes were tested in a flapping mechanism to evaluate how various skeletal topologies (geometry of the skeleton) affect the thrust generation of the wings. Wing deformation was measured through the entire flapping cycle using digital image correlation to determine how the skeleton influences deformation. No vehicles result from this study.

3. Air Force – Adaptive, active and multifunctional reinforced polymer composites and hybrids for micro air vehicles test bed, $341,531

This project is an ITAR controlled project and therefore no details can be provided. No vehicles are being developed under this contract. Smart materials are being evaluated for use on micro air vehicles.

4. Air Force – Triggering mechanism for shape memory – metal rubber sensing wings with superb in-flight responsivity, $50,000

This project is an ITAR controlled project and therefore no details can be provided. The project involves the partnership with Nanosonic Inc to evaluate their metal rubber product for use in micro air vehicles. No vehicles are developed under this contract.

5. Army – Collection of digital aerial imagery in support of aquatic invasive species program, $246,243

This work involves the development of an unmanned aircraft system to provide a platform for aerial mapping and surveys in inaccessible areas, such as the Florida Everglades and Lake Okeechobee. The aircraft has a 9 foot wingspan, weighs 12 pounds and can carry up to 4 pounds of camera payload. It flies via an off-the-shelf autopilot purchased from Procerus. The camera payload is comprised of a digital SLR camera with a high resolution inertial measurement unit (IMU). Images from the camera are synchronized with the information from the IMU using an onboard computer. The images are down loaded after a flight to produce a mosaic of the individual images, much like Google Earth. The flight duration is 90 minutes and the altitude is limited by FAA to 1200 ft above ground although the aircraft is capable of much higher flights. The range of the aircraft is limited to 1 mile line of site by the FAA, although it is

capable of more. The vehicle is capable of landing in water and is used to evaluate invasive plant species, animal populations and health of civil infrastructure. Details of the research can be found at http://uav.ifas.ufl.edu/.

6. Air Force – Characterization of the time-dependent fluid-structure interaction and passive flow control of low Reynolds number, $86,998

This research involves studying the effects of elastic materials for the membrane of flexible wing micro air vehicle. The work does not include fabricating UAVs of MAVs, but rather understanding the physics of how the membrane vibrates during simulated flight in wind tunnels. Idealized wing geometries are tested in the wind tunnel to determine how the membrane vibration affects the airflow over the wing and how the airflow deforms the wing. This project for the first time combines digital image correlation and particle image velocimetry into one experiment. Results from this work will help guide the design of micro air vehicles in the future.

7. Air Force – Biologically-inspired, anisotropic flexible wing for optimal flapping flight, $369,497

This is a MURI level project that involves participation of researchers at the University of Florida, University of Michigan and University of Maryland. The goal is to understand the fundamental physics of flapping wings. More specifically to understand how to create anisotropy in the wing to optimize thrust generation of the flexible wing. The project involves both experiment and modeling. The project does not include any development of vehicles.